

Article



Incidental vocabulary acquisition from stories: Second and fourth graders learn more from listening than reading

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Abstract

Both reading and language experiences contribute to vocabulary development, but questions remain as to what effect each has and when. This article investigates the effects that reading, telling and sharing a story have on vocabulary acquisition. Children ($N = 37$) were told nine stories in a randomized, single-blind and counterbalanced 2×3 mixed design. The between-subjects variable was grade (2 vs 4) and the within-subjects factor was the story condition, being either read (adult read aloud) or told (free story telling) to the children, or read silently by the children (independent reading). Each story contained two rare target words that were unlikely to have been previously known to the children. Measures of receptive vocabulary, decoding, reading comprehension and target vocabulary acquisition from the story were also administered. Children in grade 4 performed better on the vocabulary acquisition test and there was a main effect for

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story condition; children learnt the least number of words when reading the stories independently and the most from the free story telling condition. Implications for vocabulary learning and the importance of oral language exposure – even for established readers in primary school – are discussed.

Keywords

Language development, reading, reading comprehension, story telling, vocabulary

Reading undoubtedly opens the door to a seemingly infinite world of lexical items that can potentially provide a richness and breadth to vocabulary development unlikely to be found in most spoken contexts. Indeed, having a broader lexicon is an advantage, not only for language, but also for reading (Biemiller & Slonim, 2001; Cromley & Azevedo, 2007; Joshi, 2005; Sénéchal, Ouellette, & Rodney, 2006) and academic success (Biemiller, 2006). As such it is not surprising that some commentators argue that children's early reading skill provides a potential pathway to bolster vocabulary development (Ehri, 2012; Reschly, 2010; Stanovich, 1986). There exists correlational evidence showing that children who read more in the early grades have greater vocabulary development (Cain & Oakhill, 2011; Mol & Bus, 2011), even 10 years later (A. E. Cunningham & Stanovich, 1997).

However, it is methodologically and conceptually premature to conclude that early reading – typically defined as developing decoding around ages four to six with fluent reading being established around age seven to eight (Suggate, Schaughency, & Reese, 2013) – is the sole or best vehicle through which to improve children's vocabulary. First, children learn a remarkable number of words before they acquire even elementary reading skills (Biemiller, 2006; Diesendruck, 2009), thus there are clearly other sources of language acquisition than reading. Second, children require foundational reading comprehension skills before they can garner new words and word meanings from the activity of reading (e.g. Nation, Snowling, & Clarke, 2007). Third, children must read texts that actually expose them to new words, which is not always the case (Nagy & Anderson, 1984). Fourth, home literacy environment and elementary reading skills are confounded by social background (Van Steensel, McElvany, Kurvers, & Herppich, 2011), thus, the greater vocabulary development in fluent readers might stem from richer verbal communication or increased reading.

Existing work has extensively documented vocabulary acquisition for children from spoken environments (e.g. Biemiller, 2006; Diesendruck, 2009), for kindergarten and school children from shared reading (e.g. Lonigan, Shanahan, Cunningham, & the National Early Literacy Panel, 2008) and for middle elementary school children from independent reading (e.g. Swanborn & de Glopper, 1999). However, no study has looked at how these three different categories of experience differentially affect children's vocabulary development at an age when they are fluent readers and/or fluent reading comprehenders. Therefore, we present the first experimental investigation of children's vocabulary acquisition arising from *free story telling* (i.e. adult tells story without text), *adult read-aloud* (i.e. adult reads story aloud to children) and *independent reading* (i.e. child reads story silently without adult) simultaneously. Clearly still other possibilities to

stimulate vocabulary exist, such as formulaic vocabulary instruction, but our goal here is to estimate the effectiveness of independent reading by comparing it with oral modalities.

Influences on vocabulary development

Exactly what it means to learn a word is a complicated phenomenon, touching on the fields of philosophy, psychology, education and linguistics. Here we simplify the problem and consider that a new vocabulary item has been acquired if a child can demonstrate above chance performance at correctly associating the target word and its corresponding object.

Independent reading

Evidence that children can acquire novel vocabulary items from independent reading arises from studies of incidental word reading. In these studies children read passages of text and are then tested on the meaning of target words afterward (Swanborn & de Glopper, 2002) or they are asked to derive the meaning of underlined words as this relies less on memory (Fukkink, Blok, & de Glopper, 2001). Word learning from these tasks depends on features of the word (i.e. imageability, concreteness), context, purpose of reading, number of exposures and how it is scored (i.e. credit for partial meanings vs absolutely correct) (Fukkink et al., 2001; Shu, Anderson, & Zhang, 1995; Swanborn & de Glopper, 1999, 2002). Overall, a meta-analysis of incidental word learning during reading indicated that children acquired 15% of unfamiliar words with grade being a strong predictor (Swanborn & de Glopper, 1999).

A second line of evidence has explored the extent to which the amount children read explains reading comprehension and vocabulary development (e.g. Cain & Oakhill, 2011; A. E. Cunningham & Stanovich, 1997; Mol & Bus, 2011). Although these studies generally find that children who read more have greater vocabularies, it is difficult to know which factors determine what in these non-experimental designs. For example, home environments where children read might also have richer language.

One advantage for learning words from reading text might be that children are thereby exposed to the visual representation of the word's orthography, particularly if stimulating two sensory modalities is better than one. In two experimental studies under conditions resembling formulaic vocabulary acquisition, children were exposed to the orthographic representation of the words to be learned along with an oral presentation. Even though children's attention was not drawn to the words, they exhibited better learning of those words (Rickets, Bishop, & Nation, 2009; Rosenthal & Ehri, 2008).

Finally, an important factor in children being able to acquire new vocabulary from independent reading is their skill at both reading and language (Cain & Oakhill, 2011; Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003; Nation et al., 2007) – because reading is language processing in written form (e.g. Gough & Tunmer, 1986; Storch & Whitehurst, 2002; Whitehurst & Lonigan, 2001). If reading skill is insufficient then decoding of surrounding words is either laborious or not possible, reducing availability of important contextual information and diverting precious attention

resources away from comprehension to decoding (Leong, Tse, & Hau, 2008). Likewise, if language development is insufficient to comprehend the sentence, derivation of its meaning is difficult.

Shared reading

During shared book reading, because an adult typically reads the text or can help when difficulty arises, children's exposure to vocabulary is not constrained by their reading skills. Accordingly, children for whom reading comprehension skill is not as automatic as their language comprehension skill, shared reading might prove more effective in stimulating vocabulary growth than independent reading. Additionally, during shared reading children have a greater opportunity to ask questions (Van Steensel et al., 2011) and engage in discussion to clarify word meanings (an aspect of joint attention, Farrant & Zubrick, 2012). Indeed, both quantitative and narrative research syntheses on the effects of shared book reading indicate positive effects on children's vocabulary development (Lonigan et al., 2008; National Early Literacy Panel, 2008).

Free story telling

Given the remarkable growth in children's vocabularies – from around 50 words at 18 months to between 5000 and 10,000 words at age six, depending on the estimate (Biemiller, 2006; Diesendruck, 2009) – it is important to consider non-reading influences on vocabulary development. For most of these first six years, it is likely that children acquire most of their words through mechanisms such as joint attention and overhearing (Gampe, Liebal, & Tomasello, 2012). Even if a five-year-old were to spend 30 minutes a day reading books or being read to, this would only constitute 3.13% of a 16-hour waking day. Thus, shared reading can make a contribution (Blewitt, Rump, Shealy, & Cook, 2009; Chow, McBride-Chang, Cheung, & Chow, 2008; Lonigan et al., 2008; Sénéchal, LeFevre, Thomas, & Daley, 1998) but it seems implausible that text-related experiences drive vocabulary development in this age.

Clearly, children's early language growth must be driven by non-textual, oral language experiences (Biemiller, 2006). If one advantage of shared reading over independent reading were the adult's easing decoding constraints on contextual information needed to infer word meaning, then it seems pertinent to consider the effect of removing text altogether to better approximate the oral language experiences driving children's vocabulary development. In a story retell without reading from text, the story teller is freed from focusing on the text and could thus engage children more in the story, through increased eye contact, spontaneous usage of props to demonstrate the story and tailor prosody to children's interest during story delivery. Indeed, children's engagement in decontextualized talk boosts vocabulary development (e.g. Wasik & Bond, 2001).

The current study

There is clear evidence that children are able to acquire new vocabulary items through reading (Swanborn & de Glopper, 1999), shared book reading (Lonigan et al., 2008)

and non-text language experiences (Biemiller, 2006; Nagy & Anderson, 1984). Accordingly, given the importance of vocabulary for language, literacy and academic development, there are good practical reasons to experimentally test the effect of story modality (i.e. independent reading, story telling and shared reading). Additionally, because children's reading skills in relation to their language skills improve more across early elementary school, it might well be that independent reading becomes a more effective source of vocabulary development. Further, by including reading and vocabulary measures as predictors, such a study could test the reading and language prerequisites to vocabulary learning in each condition. Such an investigation would also inform the contentious issue of when and if children's vocabulary development derives unique benefit from having reading skills and experiences versus being in oral language environments (Suggate, 2012; Suggate, Schaughency, & Reese, 2011; Suggate et al., 2013).

Therefore, we conducted an experiment testing the influence of story modality on vocabulary acquisition. We designed the conditions to be as closely matched as possible in terms of factors found to affect vocabulary acquisition (i.e. length, context, genre, purpose and vocabulary complexity; Fukkink et al., 2001; Shu et al., 1995; Swanborn & de Glopper, 1999, 2002), differing predominately in terms of whether the story was conveyed via (a) independent reading, (b) a variant on shared reading, or (c) free story telling. However, to increase the similarity between conditions, we deviated from a conventional shared reading paradigm, in which both adult and child share a book, perhaps taking turns reading for example. The main reason for this was that we wanted the interactiveness of the conditions to be similar, with the experimenters retaining a similar spatial distance from the children and children having equal encouragement to interact with the experimenters across all conditions. Therefore, instead of shared reading, we devised a condition that is better described as an adult read-aloud condition, because the story was read aloud with less emphasis upon sharing the book reading. Importantly, the adult read-aloud condition contains the important feature of shared reading whereby the adult relieves the load for the children of having to decode the text, although it might not be as interactive as conventional shared reading conditions. Accordingly, the oral conditions (i.e. adult read-aloud and free story telling) versus independent reading manipulates the role of children's decoding skill requirements and the free story telling versus reading conditions allows investigation of the effect of the story-teller having to read from text. Thus, we exposed the children to fictitious stories, each containing words unlikely to be previously known to the children. Because multiple exposures and varying contexts are needed for novel vocabulary items to be acquired, each word was mentioned multiple times in each story.

In line with previous research (Swanborn & de Glopper, 1999), we thought that children's grade level – and therewith vocabulary development and reading skills – was likely to be an important factor. Thus we recruited two groups of children, one nearing the end of grade 2 and the other nearing the end of grade 4. Furthermore, we selected children speaking German because this language is more transparent than English and ought therefore to pose fewer problems to beginning readers decoding unfamiliar words (Seymour, Aro, Erskine, & COST Action Network, 2003). Grade 2 children in Germany can be expected to have competent decoding skills and grade 4 children should be

established readers-for-meaning. Specifically, according to federal educational standards (KMK, 2004), by this time students should be able to select texts on their own, locate specific information, summarize and notice potential misconceptions in their own understanding.

The experiment addressed the following research questions. First, we sought to determine whether target-word learning was greater in any of the story modality conditions and whether this varied as a function of grade. As a check on the validity of this paradigm for vocabulary learning, we then sought to establish whether learning in the story modality conditions related to children's existing skill. Specifically, we hypothesized that children with greater reading comprehension should acquire more target words from independent reading, precisely because deriving meaning is an important component of reading comprehension. Further, because decoding is part of reading comprehension, the relations between word acquisition from independent reading and decoding skill should be positive but smaller than that between reading comprehension and word acquisition from independent reading. Conversely, we expected children with greater vocabularies to acquire more target words from the oral story conditions. Third, to begin to explore causes for any differences in vocabulary acquisition as a function of the experimental conditions, we wanted to test whether key structural features of the story modality conditions explained performance in target-word acquisition. Here we focused on the total number of words, rarity of vocabulary items used and the duration of the story as proxies for the structural closeness of the retelling to the original story. Additionally, we accounted for the number of filler words (e.g. ah, um) in the retelling, because we thought such filler words would be unique to free telling and might disrupt the flow of the story.

Method

Participants

The participants were 20 grade 2 and 17 grade 4 students with a mean age of 8;3 ($SD = 4.64$ months) and 10;2 ($SD = 3.62$ months) years respectively. There were 11 boys in each grade. All children were born in Germany, all parents except those of two children indicated their ethnicity as being German, and three children spoke a second language at home. All children had at least one parent who left school with a formal educational qualification, 12.90% completed the vocational track of high school, 16.13% obtained university entrance, 24.73% achieved a professional post-school qualification and 24.73% completed a university qualification as their highest level of education. The proportions achieving these respective levels of education did not differ between grade 2 and grade 4 samples for mothers, $\chi^2(3, 36) = .61$ $p = .89$, or fathers, $\chi^2(3, 35) = 2.76$ $p = .43$.

Measures

Demographics. Parents completed a demographic questionnaire focusing on their and their children's country of birth, ethnicity, languages spoken at home other than German and the parents' highest educational qualification.

Peabody Picture Vocabulary Test IV (PPVT-IV). A German translation of the PPVT-IV was used to assess children's vocabulary development. In English the PPVT-IV exhibits good reliability and validity (Dunn & Dunn, 2007) and has been extensively used in research. In the translation process, we attempted to match the difficulty in German and English using two approaches. The first was a quantitative check on the frequency with which items appeared in both languages, using a lexical database (<http://corpora.informatik.uni-leipzig.de/>). Both individual items and entire sets of 12 words (because PPVT-IV discontinue rules apply to sets) were matched for frequency of appearance in the database. Second, fluent speakers of both German and English (including natives from both languages) considered via subjective appraisal whether the items were matched in difficulty. For example, care was taken to avoid words that would be more easily recognized in the one language or the other, usually due to a salient morphological feature of the words in one of the languages. Raw scores are reported. Field trials with this measure in Germany indicate similar raw scores to the US normative sample and positive correlations with other language skills (on a grade 2 sample, $n = 36$, $r = .65$ with listening comprehension, $r = .41$, with narrative quality of story retelling, all $p < .05$), similar to those found in other work (e.g. Reese, Suggate, Long, & Schaughency, 2010).

Decoding. One subtest of the standardized reading test ELFE 1-6 (Lenhard & Schneider, 2006) assessed decoding skill. Students had to correctly identify one word from a list of four alternatives that matched with a given picture. The 72 items are arranged in ascending difficulty and the students have three minutes to identify as many words as possible. The test manual reports that this subtest has an internal consistency of $\alpha_{cr} = .97$ and a retest reliability of $r_{tt} = .95$. In this study, the estimate of internal consistency was also $\alpha_{cr} = .97$.

Comprehension. To assess reading comprehension, we used the comprehension subtest of ELFE 1-6 (Lenhard & Schneider, 2006). This subtest contains 20 multiple choice items each containing a short text, a question and four alternatives. The items are again arranged in ascending difficulty and the student has seven minutes to complete the task. We shortened this task to be of five minutes duration to avoid ceiling effects in the data. The test manual indicates an internal consistency of $\alpha_{cr} = .92$ and a retest reliability of $r_{tt} = .89$. Here, we obtained an internal consistency of $\alpha_{cr} = .89$.

Target-word acquisition. To test target-word acquisition from the three different types of story telling, an identical test format to the PPVT-IV was utilized. The experimenter said each target word aloud and the children indicated from one of four pictures that which best matched the read-aloud word, giving a maximum score of 18, a minimum of zero, with a chance performance through random guessing expected at 4.5 correct.

Stimuli

Nine fictitious stories of between 200 and 250 words were written for this study. In each story two target words were incorporated into the plot in the natural course of the stories. These target words were nouns and generally selected from Old German to have a rare

frequency of occurrence in the modern language (as determined by subjective appraisal of native speakers and by verifying occurrence in the lexical database <http://corpora.informatik.uni-leipzig.de>). Thus, target words were highly unlikely to have been familiar to the participants. Examples of these target words are *Klampfe* (meaning *guitar* but vastly different to the modern German word *Gitarre*, perhaps closer to the Old English *gittern*), *Kardätsche* (comb, again outdated, perhaps the distant equivalent in English would be *kemp*) and *Zuber* (bowl, perhaps closer to the Medieval English *tubbe*). We used rare but real words instead of pseudo words to make the stories more realistic and avoid making the target words overly salient, which may have been more likely with non-words as target words. Each word appeared three times in the stories. To simulate real-life free story telling, half of the target words in each free story telling were accompanied by spontaneous use of a prop, representing either the object or a photo of the object represented by the word (e.g. a guitar, a comb, a bowl).

Procedure

Letters inviting participation were sent to parents of children attending schools in and around the city of Würzburg, a middle sized city in Germany with a population of around 130,000 inhabitants. For their participation in the study, parents were offered a small monetary incentive (a €15 voucher). Participants were registered on a first-come first-serve basis and the parents gave informed written consent for their child's participation. The study was conducted in the Department of Psychology in a laboratory, equipped for conducting observations and experiments with human subjects. Parents then left the room after completing the demographics questionnaire (usually to frequent the town centre while their child participated in the study) and the study was conducted by two researchers, with children hearing the stories as pairs but being tested individually on the outcome measures. The experiment itself was conducted by the third author (PhD student) and two trained psychology and education students.

At the start of the experiment proper, the PPVT-IV test of receptive vocabulary was administered to build rapport between the experimenters and participants, because in our experience children usually enjoy this interactive task. Next three stories were presented in one block, with each block containing one of each of the story modalities with the order randomly assigned for each pair. The three blocks of stories were separated by the reading tests, to avoid children becoming disengaged and bored from what would have otherwise amounted to hearing nine stories in a row. Thus, after the first set of three, the decoding test was administered, followed by the second set of three stories, then the reading comprehension test, and then the third set of stories. In the reading condition the participants were told to take their time reading the stories because we may ask them about the stories afterward. To reduce recency effects, the experimenters then engaged in peripheral conversation with the children for two minutes. Finally, the children were tested on the 18 item vocabulary acquisition test.

The story conditions. The duration of the conditions was recorded to allow subsequent analysis of the similarity of free story tellings. Additionally, the second experimenter noted when children asked questions. The experimenters made no mention of the

existence of target words or that any word meanings would later be tested. Target words were not emphasized – they were simply spoken aloud in the same manner as other words in the story.

Independent reading. To focus the children on reading the stories with a purview to comprehension in the independent reading condition, the children were asked to read each story carefully because the experimenter might later ask questions about it. The children were further instructed to let the experimenter know when they had finished reading the story and were free to ask questions during the story, although they were not explicitly told so. The target words in the passages were not marked in any way.

Adult read-aloud condition. In the adult read-aloud condition one of the experimenters read the stories to the children at a normal pace and speaking with a clear voice (approximately 150–200 words per minute). Children listened but had no opportunity to read the text silently. As with the other conditions, children were free to interrupt the experimenter with questions. Target words were again not emphasized – they were simply spoken aloud in the same manner as other words in the story.

Free story telling condition. In this condition the researchers retold the gist of the stories to children, again at a normal pace for story telling to children of this age and in a clear voice (approximately 150–200 words per minute). There were two key differences between this condition and the adult read-aloud condition. First, the story-tellers did not have to focus attention on reading the text, thus they were more able to make and maintain eye contact with the children, making this modality more interactive. Second, to simulate free story telling in which the narrator can spontaneously use a prop, one of the two target words per story included household props that the story-teller used during the narration. The experimenters were instructed to naturally incorporate the props into the free story telling, on one occasion per story. Again the children were free to interrupt the story with questions.

During the story telling condition, the second researcher who was not telling the story recorded the number of times that the target words were mentioned by the narrator, to ensure that the researcher mentioned the word exactly three times, to match the independent reading and read-aloud conditions. After the third mention of the target words, the second researcher provided a discrete hand signal to the narrator to indicate that the word should not be mentioned again.

To monitor the integrity of the free story telling conditions, audio digital recordings of the free story telling conditions were made and later transcribed. Transcripts were evaluated for key features, namely, length, total number of words, number of filler words (e.g. um, ah), vocabulary complexity and closeness to the original text. Vocabulary complexity was estimated by determining the frequency of occurrence of each word in the free story telling using a lexical database (<http://corpora.informatik.uni-leipzig.de>). The obtained values indicate the frequency to which the target word appears in the written language in comparison to the most frequent word in the database, by a power of 2 (e.g. the word ‘house’ has a value of 8, meaning that the most frequently appearing English word ‘the’ appears 2 to the power of 8 times more frequently than ‘house’). To

monitor fidelity of the free story telling, the closeness of the individual free story tellings to the original written stories was estimated using latent semantic analysis. This programme was developed to provide student feedback while summarizing passages to improve reading comprehension (Lenhard, Baier, Endlich, Schneider, & Hoffmann, 2011). The latent semantic analysis software returns a coefficient (between zero and 1) that approximates a correlation coefficient and indicates semantic similarity, with a high coefficient indicating greater semantic overlap. For example, the following two sentences are semantically identical, but share no content words (please note, stop words are excluded and flections are treated as distinct words): 'Penguins are birds living on the soil. They are able to swim in the sea and feed on fish and krill' and 'A penguin is a bird that cannot fly. It swims and eats fishes and small crabs.' The semantic similarity, measured by the LSA cosine, amounts to $\cos \alpha = .57$.

Design

Neither the children nor the parents were aware of the exact purpose of the study, making it single-blind. The design was 2×3 mixed, with participant grade being the between-subjects factor (grade 2 vs 4) and story modality (independent reading, adult read-aloud, or free story telling) the within-subject factor. Crucially, the order of story modality presentation for different pairs was randomized to discount possible order effects. Additionally, the assignment of the nine stories to each of the three modality conditions was randomized so that the same stories were not consistently presented in a particular story modality.

Results

On two occasions only a single child was present in the story condition and on one occasion three were because of a scheduling misunderstanding. On only four instances during 333 stories did the children ask a question, twice in the adult read-aloud and twice in the story telling condition. Likewise, on four occasions the experimenter mistakenly mentioned one of the target words four times instead of three during the free story telling condition, giving – across 37 participants each exposed to three free story tellings with two words mentioned three times – 226 instead of 222 target-word exposures. Because both the frequency of questions and the frequency of errors in target-word mentions was negligible, no further account of these factors was taken. Due to experimenter error, in six out of a total 220 instances, *in vivo* duration of the free story telling or adult read-aloud condition was not recorded and subsequently substituted for the analyses by the participant means and data derived from transcripts as appropriate. We also examined box plots, skew and kurtosis summary statistics for the dependent variables to ensure normal distributions.

The effect of story modality on target-word acquisition

In Table 1 the scores on the reading and vocabulary measures are reported and the total number of words recalled from the experimental conditions. Grade 4 children had

Table 1. Performance on vocabulary, reading and target-word acquisition as a function of grade.

Measure	Grade 2			Grade 4			<i>d</i>	<i>t</i>
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range		
Receptive vocabulary	126.85	16.64	92–155	151.18	11.65	133–170	1.67	5.06**
Reading comprehension	9.25	3.75	4–20	14.53	3.32	7–20	1.48	4.50**
Decoding	39.50	10.28	24–66	57.59	10.12	34–71	1.77	5.37**
Target-word acquisition	9.85	2.96	4–15	12.00	2.29	7–16	.80	2.44*

**p* < .05, ** *p* < .001.

Table 2. Correlation coefficients between the reading, vocabulary and target-word acquisition.

		1	2	3	4	5
1	Receptive vocabulary	–	.47*	.40*	.27	.46*
2	Decoding fluency		–	.74**	.23	.17
3	Reading comprehension			–	.42*	.29†
4	Target-word acquisition from reading				–	.30†
5	Target-word acquisition from oral modalities					–

†*p* < .10, * *p* < .05, ** *p* < .001.

superior task performance on all measures compared to grade 2 children. To explore the relations between the existing vocabulary and reading comprehension skills and target-word acquisition from reading and hearing the words, bivariate correlational analyses are presented in Table 2. Because of the theoretical links between reading comprehension and target-word acquisition from independent reading, and likewise for the oral modalities for vocabulary scores, story telling and adult read-aloud are aggregated in Table 2. The correlations in Table 2 indicate that reading comprehension was significantly related to acquisition of vocabulary during independent reading (*p* < .05) and receptive vocabulary was associated with learning words aurally. Decoding skill did not correlate with vocabulary acquisition. In Table 3, we present the raw vocabulary acquisition scores and time spent in each of the experimental conditions.

The data in Table 3 indicate that children in grade 4 performed better than children in grade 2 in the independent reading and adult read-aloud conditions. Also, children in grade 2 read the stories much more slowly than children in grade 4 did. Critically, the scores that would be expected on the vocabulary tests due to chance (i.e. total score divided by 4 = 1.5 and .75 for the prop vs no-prop comparison) lay outside the confidence intervals on all occasions.

We conducted a 2 × 3 mixed ANOVA on the target-word acquisition scores. This had grade as the between-subjects factor with two levels (grade 2 vs grade 4) and story

Table 3. Target-word acquisition and condition duration as a function of story modality.

Story modality	Grade 2			Grade 4			Grade 2 vs 4		
	M	SD	Range	M	SD	Range	95% CI	d	t
Independent reading									
Words correct	2.60	1.35	1-5	3.41	1.12	1-5	2.83-3.99	-.65	1.96†
Total duration (sec)	428	33	178-814	259	60	133-373	228-290	3.57	10.83**
Adult read-aloud									
Words correct	3.20	1.54	1-6	4.24	1.20	1-6	3.62-4.86	-.75	2.26*
Total duration (sec)	267	9	248-285	266	9	256-285	261-270	.11	.34
Free story telling									
Words correct total	4.05	1.36	1-6	4.35	1.27	2-6	3.70-5.00	-.23	.69
Words correct props	2.10	.91	0-3	2.35	.70	1-3	1.99-2.71	-.30	.92
Words correct no-props	1.95	.89	0-3	2.00	.71	1-3	1.63-2.37	-.06	.19
Total duration (sec)	345	38	300-426	322	42	274-418	300-344	.58	1.75†

Notes: CI = confidence interval. The maximum possible number of words correct is six each for independent, adult read-aloud and free story telling, and three for the props/no-props scores and a chance performance would be 1.5 correct.
† $p < .10$, * $p < .05$, ** $p < .001$.

modality as the within-subjects factor with three levels (independent reading vs adult read-aloud vs free story telling). The main effects of grade, grade 2: $M = 3.28$, $SE = .20$, grade 4: $M = 4.00$, $SE = .22$, $F(1, 35) = 5.93$, $p = .02$, $\eta^2 = .15$, and story modality were significant, but the interaction was not, $F(2, 70) = .90$, $p = .41$, $\eta^2 = .03$. The group means as a function of story modality indicated that independent reading was less effective, $M = 3.01$, $SE = .21$, than the adult read-aloud condition, $M = 3.72$, $SE = .23$, both of which were in turn less effective than the free telling condition, $M = 4.20$, $SE = .22$, $F(2, 70) = 9.26$, $p < .001$, $\eta^2 = .21$. Pairwise comparisons indicated that free story telling was statistically significantly better than independent reading ($p < .001$) and adult read-aloud ($p = .05$), but adult read-aloud was not better than independent reading ($p = .30$). A 2×2 repeated measures ANOVA tested whether there were differences in scores on the word test as a function of whether props were present in the free story telling task, to which there was no significant main effect of grade, $F(1, 35) = .49$, $p = .49$, $\eta^2 = .01$, or of prop usage, $F(1, 35) = 2.51$, $p = .12$, $\eta^2 = .07$, or their interaction, $F(1, 35) = .41$, $p = .53$, $\eta^2 = .01$.

Inspection of the data in Table 1 in graphic form led us to test more specifically the relation between adult read-aloud, independent reading and grade because there appeared to be a clear advantage for adult read-aloud over independent reading that may not have been detected due to including the extra numerator degree of freedom in the previous ANOVA including the free story telling condition. Therefore, we ran a 2×2 ANOVA as per above, but without the free story telling modality. In this ANOVA, there was an advantage for adult read-aloud, $F(1, 35) = 6.31$, $p = .02$, $\eta^2 = .15$, and grade, $F(1, 35) = 7.67$, $p < .01$, $\eta^2 = .18$, but the interaction was not significant, $F(1, 35) = .16$, $p = .70$, $\eta^2 = .00$.

Features of free story telling

We conducted analyses to test the role that features of the free story telling might have played in children's performance on the vocabulary acquisition test. Structural features of the story included story duration, number of words, frequency of occurrence of vocabulary items as a proxy for vocabulary complexity and number of filler words used (e.g. um, ah). Additionally, as a check on fidelity of free story telling, results from the latent semantic analyses were included. The latent semantic analysis coefficient ($\cos \alpha = .53$) indicated that the semantic fidelity of the free story telling was similar in content to the written story (as indicated by the mean coefficient in excess of .50). All of these structural and content story variables were correlated with the number of target words acquired from each condition. Overall, correlation coefficients were small and non-significant with the exception of, expectedly, number of words and duration ($r = .83$, $p < .01$) and number of words and vocabulary complexity ($r = .35$, $p < .05$), indicating that longer stories had a greater number of words and contained more common vocabulary items. Crucially, none of these story features correlated with target word acquisition (r s between $-.10$ and $.09$, ns) or with the latent semantic analyses of semantic fidelity to the original story (r s between $-.18$ and $.16$, ns). Finally, analyses between duration of the condition for all story modalities were conducted to test, on the entire sample of stories, whether differences in story length might have accounted for the

advantages for the oral conditions. Partial correlation coefficients, controlling for grade, between condition duration and vocabulary acquisition from the respective conditions were not significant for: independent reading, $r(34) = -.04$, $p = .84$, adult read-aloud, $r(34) = -.15$, $p = .38$, or free story telling, $r(34) = -.14$, $p = .43$.

Discussion

We conducted a controlled, randomized and counterbalanced experiment testing the effect that different story modalities had on target-word acquisition of rare vocabulary items, for children in grades 2 and 4. Supporting the inference that children in all conditions and grades learned new words, the confidence intervals around their performance on the target-word acquisition exceeded that expected by chance. Further, results indicated that children performed best on the target-word items that were presented via the free story telling condition, followed by the adult read-aloud, and then independent reading conditions. Moreover, as the means in Table 2 suggest, the superiority of free retelling over adult read-aloud in grade 2 did not appear to be a function of prop usage, as the advantage for having a prop in the free story telling was slight and non-significant. This finding occurred even though there was no time limit in the independent reading condition, such that children were free to take their time to reflect on the meanings of misunderstood sentences. In contrast, in the adult read-aloud and free story telling conditions, which ran at the pace of the story-teller, the children had little opportunity to revise and re-read words that they did not understand. Aside from story modality, grade also mattered, with older children performing better across all conditions.

As expected, children with greater receptive vocabularies had greater performances in the oral story modalities (i.e. story telling and adult read-aloud) and likewise those with better reading comprehension skill learned more words during independent reading. These findings are theoretically consistent, given the advantage that reading comprehension skill should provide in using surrounding information to derive unfamiliar word meanings (e.g. Cain, Oakhill, Barnes, & Bryant, 2001) and likewise children with greater vocabularies ought to better derive meanings of unfamiliar words presented orally (e.g. Biemiller, 2006). Decoding and receptive vocabulary did show positive correlations with target-word acquisition from independent reading, but these were not statistically significant. Presumably, this was because decoding and vocabulary are important for reading comprehension but more distally related, in that it is possible to have either skill but still be a poor reading comprehender (Nation et al., 2007). Together, these observed correlations between (a) reading comprehension skill and vocabulary scores from the independent reading condition and (b) previous receptive vocabulary and scores from the oral story conditions, suggest that our experimental paradigm exhibited real-world validity.

To our knowledge, the current findings provide the first experimental evidence that directly compares children's vocabulary acquisition from reading versus hearing a story, providing an important baseline against which to evaluate the relative merits of each approach. In the first instance, the findings provide evidence that – even though the contribution is comparatively smaller – grade 2 children can also improve their vocabularies by reading. Thus, we extend previous findings from older children (Swanborn & de Glopper, 1999) and also support a key aspect of the Matthew Effect, in that the activity

of reading may improve vocabulary even as early as grade 2 (A. E. Cunningham & Stanovich, 1997; Mol & Bus, 2011; Reschly, 2010; Stanovich, 1986). Additionally, this experiment furthers our understanding of textual influences on vocabulary acquisition because it lends experimental evidence to correlational studies suggesting that greater reading comprehension skills lead to greater vocabulary acquisition from reading (Cain et al., 2001; A. E. Cunningham & Stanovich, 1997).

Returning to one of our experimental aims of comparing vocabulary acquisition from reading against other conditions, the more novel findings emerged from the comparison of text reading with story telling, either via adult read-aloud or free story telling. In support of the observation that children acquire a large part of their adult vocabularies without relying on reading skill, the oral modalities resulted in superior word learning compared to independent reading, even in children who were competent readers. Specifically, free story telling resulted in the greatest scores on the vocabulary test and when this condition was removed from the analyses, adult read-aloud resulted in greater scores than independent reading did. Moreover, important structural and vocabulary-complexity features of the free story telling did not appear to relate to target word acquisition, increasing confidence that it was something about the free telling condition that lead to the observed effects. Thus, even for competent grade 4 readers, adult read-aloud and story telling may be a more effective means to improve vocabulary development than independent text reading. This would not of course mean that children should be deterred from independent reading, but that free story telling remains an important weapon in teachers' arsenals. Additionally and in further support of the findings, it is often the conversation around a book that leads to language learning (e.g. Clark, 2010; Reese & Cox, 1999).

The practical reality of modern education and learning environments does not guarantee that children have adults ever-present to tell them stories and provide rich language environments; therefore, we consider the educational significance of our findings. Unfortunately, it is not difficult to imagine that some children might have such impoverished access to story opportunities so as to render independent reading the best option available to support their vocabulary development. It is also likely that practice with reading hones children's abilities at deriving word meanings from independent reading. Similarly, because we did not include a more typical formulaic vocabulary instruction condition (whereby word meanings are explained and demonstrated), we do not claim that free story telling is the best method to improve children's vocabularies. However, the current findings underscore that if the goal is vocabulary development, then even for grade 4 children free story telling is important.

Two features of this study that may be perceived as limitations are now discussed, namely, the sample size and the lack of a pre-test of the target-word items. Regarding the latter, we can rule out the possibility that children previously knew the words which lead to the story modality effect because the assignment of the stories to the conditions was randomized and counterbalanced across all participants. Moreover, in the absence of ceiling and floor effects the different conditions resulted in different scores – which would not be expected if previous knowledge were the sole determinant. However, because grade could not be randomized and we did not provide a pre-test on the target words we cannot distinguish between whether older children learned

more words or simply had more words in the first place. Similarly, because story order and modality were counterbalanced and randomized, primacy and recency effects were highly unlikely.

The findings did not suggest that sample size was a problem, at least in detecting the main effects, because our findings reached statistical significance, thus discounting type II error. There were some suggestions of an interaction between modality and grade, as the advantage for free story telling over independent reading reduced for grade 4. This could be due to type II error or the age sampled, perhaps an interaction might have been observed if older children were used instead. Additionally, that the independent reading condition for grade 2 children lasted substantially longer than the other conditions suggests that these children were not hurried through the independent reading conditions. These comparatively worse readers presumably allowed themselves more time and opportunity to decipher the meaning of the text and thereby increase the likelihood of learning the target words. Time pressure is thus an unlikely explanation for their poorer performance.

However, a question remains as to the extent to which these experimental conditions generalize to educational settings. For example, during the experimental conditions, the children did not follow the text with their eyes and did not interrupt to ask questions and questions were not asked of them. Therefore, we cannot compare our findings directly with more interactive reading programmes (Chow et al., 2008; Reese & Cox, 1999; Sénéchal & LeFevre, 2002; Zevenbergen, Whitehurst, & Zevenbergen, 2003). However, by designing the experiment in this way, we gained tighter control over the role of story modality, because the interactiveness of the children was more homogeneous. Additionally, our primary dependent variable measured object–word association (similar to the Peabody Picture Vocabulary Test) and therefore we do not claim that this measure indicates that children have mastered the target items, in the sense of being able to use them expressively with an understanding of nuance. Nor can we make claims as to long-term learning of the target items because we did not include a follow-up test.

Interestingly, in grade 2, the longest condition was independent reading, followed by free story telling, and then adult read-aloud. Although these differences in condition length did not correlate with vocabulary acquisition, to enable a better contrast of efficiency of vocabulary learning, the condition length might be restricted – however, we did not do this here because we wanted to match the number of target-word mentions and story content as closely as possible.

In some respects decoding in German is easier than in English (Seymour et al., 2003), therefore, we now consider whether these findings would also apply to English children. The increased difficulty of decoding in English is generally expected to prolong the amount of time that children spend grappling with decoding skills, particularly in the first year (Ehri, 2012; Seymour et al., 2003). Therefore, it might be expected that grade 2 English readers would fare worse than their peers in more orthographically regular languages. In contrast, by grade 4, children are expected to be established readers for meaning in the English-speaking countries, such that we suggest that the findings for grade 4 children would be similar. However, future research might compare vocabulary acquisition from reading and non-reading environments across languages and cultures.

In addition to cross-cultural research, investigating vocabulary development of children with different levels of reading skill (dyslexic and precocious readers) and testing more interactive methods of story telling, we suggest extending the paradigm to include older children. One purpose of including older children would be to determine whether and when reading becomes an optimal source of vocabulary development. If future research finds that all children – including those with dyslexia – still derive much profit from hearing stories, then for classrooms containing high proportions of struggling readers, instruction could continue to be primarily oral to support these learners and without disadvantaging better readers. Accordingly, future research might diversify to consider not only other aspects of language, but also aspects of learning such as fact retention, and engagement in the learning process.

Within our experimental paradigm numerous factors might also be manipulated in future research. A shared picture-book reading condition might be added to increase the semantic information available to children and therewith facilitate context-derived vocabulary development. In some respects, this would be a variation on the free story telling prop condition, in that the condition would retain some of the presumed advantages of the free story telling condition (i.e. free and tailored narration of the story) with props, as the pictures in the book might be expected to operate as a form of props. On the other hand, including a picture book might constrain the extent to which the story-teller can interact with the children. Research is therefore needed to isolate what it was about the free story telling condition that made it more effective. Prop usage might also be incorporated that is not thematically related to the target vocabulary items.

Why might free story telling be more effective?

Methodologically, the likeliest conclusion as to why the free story telling condition was the most effective is that there was some feature of the oral presentation that led to the advantage in vocabulary acquisition. It was not simply the fact that the story was spoken aloud because story telling was more effective than the adult read-aloud condition. One possibility is that there is just something more inherently interesting and social about a free story telling than hearing a story read from a book. Perhaps it is the case that a free story telling enables the teller to devote more attention to the audience, tailor prosody and capture their interest through animated body language. Conversely, it would also seem likely that the child's attention is more readily engaged during the spoken conditions and even the free story telling condition. One might speculate that it is the case that children find it more appealing to hear a story that is simply told, in addition to the reasons named above relating to story delivery, as this conveys to the listeners that the story is interesting and important, otherwise the story-teller would not have learnt it by heart. Additionally, the natural mode of speech delivery is spoken, and even more natural still is a freely delivered story; it is possible that a more natural mode of language simply presents previously unfamiliar vocabulary items in a form that is more palatable to grade 2 and 4 children. Finally, as to why both of the spoken conditions had a greater affect on target-word acquisition, we reason that having the story presented orally circumvents some of the attention demands required when reading a text independently, thus freeing up more resources for inferring the meaning of unfamiliar vocabulary items.

Conclusions

In this study we found, in the first instance, experimental evidence supporting the role that reading plays in vocabulary acquisition and also that older children performed better on the target-word acquisition test. However, our most pertinent finding was that even grade 4 children with accomplished reading comprehension skills learned more vocabulary items from hearing a story than reading it independently. Although we encourage more research, this study underscores that we should not neglect the importance of telling stories for children's language development.

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